NAVFAC
Naval Facilities Engineering Command

GROUND RULES
NOVEMBER 2016 RESTORATION ADVISORY BOARD (RAB)

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE LONG ISLAND, NEW YORK

11/16/2016

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE RAB GROUND RULES

- Respect others:
  - –One Speaker at a time
  - –No interruptions
  - –No side conversations
  - –Listen and stay open to all points of view
- Ask questions or make statements after all the presentations are given: (approximately 8:00)
  - –During the presentations, write any questions on the cards on your table and pass them forward, or raise them and they will be picked up and taken to the RAB Community Co-Chair.
  - –They will be answered after presentations are completed.
- Stay focused on the topics; avoid digressions.
- Turn cell phones and /or pagers off, or on vibrate, and respond outside or during breaks, except for emergencies.

The Management | Edge

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OPERABLE UNIT 2 - OFFSITE GROUNDWATER INVESTIGATION AND CAPTURE ZONE UPDATE

NOVEMBER 2016 RESTORATION ADVISORY BOARD

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE
LONG ISLAND, NEW YORK

11/16/2016

PRESENTATION LAYOUT

Operable Unit 2

1. Program Objectives
2. Local Groundwater Geology and Applicability to Bethpage Plume
3. 2009 – 2016 Vertical Profile Borings and Wells
4. Recent Work (Performed since last Restoration Advisory Board)
5. Future Work
6. Assessing Results and Recent Reports and Findings

Capture Zone Analysis Testing

1. Update

OBJECTIVES OF OFFSITE GROUNDWATER INVESTIGATION

1. **Protection of public water supply wells –**
   - All currently planned outpost wells are in place and being monitored quarterly
2. **Characterization of the OU2 Plume (RE108 Hotspot) –**
   - Installation of Monitoring Wells and Vertical Profile Borings to Delineate the Hotspot
3. **Capture Zone Analysis Test –**
   - Pilot Study in cooperation with Bethpage Water District (BWD) to evaluate the capture zone of one of their wells
   - Installation of a test recovery well and aquifer testing in the area southwest of BWD Plant 6

OFFSITE GROUNDWATER INVESTIGATION

Purpose: Delineate groundwater contamination in areas south of Naval Weapons Industrial Reserve Plant Bethpage

Program Components:

- **Vertical Profile Borings (VPB)** - quickly screen areas for the presence, depth, and concentration of contamination; drilling can take 4-8 weeks to complete
- **Permanent Monitoring Wells** - confirm presence/absence of contamination and develop trends; drilling can take 2-6 weeks to complete
- **Data logging of water levels** - support modeling and capture zone analysis for wells

VERTICAL PROFILE BORINGS (VPB)

- **12-inch** diameter hole drilled into the ground;
- Final boring is **860 to 1,000** feet deep (extending to the Raritan Clay Layer);
- Drilling is stopped at selected depths and a device is lowered to sample the groundwater;
- **44 groundwater samples** are collected per boring and analyzed for Volatile Organic Compounds;
- **4 to 8 weeks** to complete a boring/well.

VPB AND WELL INSTALLATION PROCESS

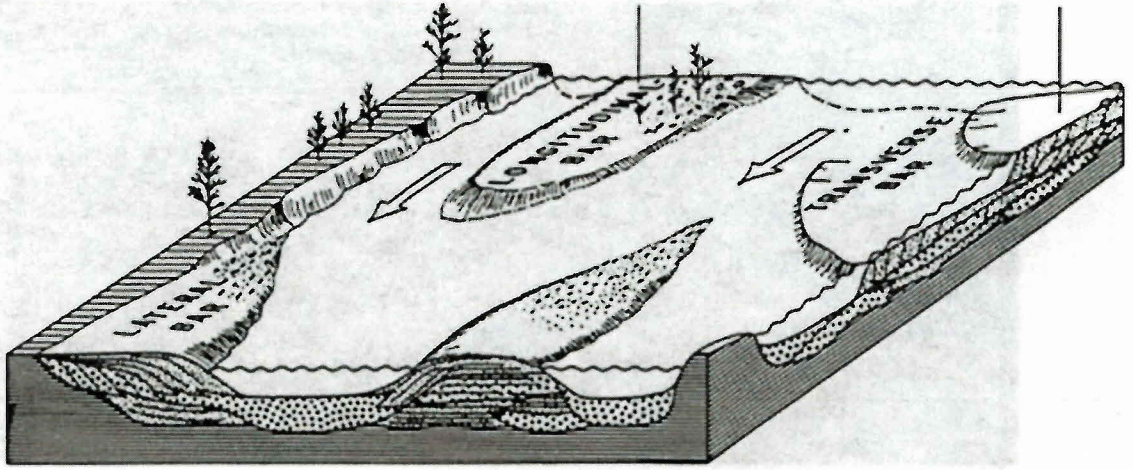
Process:

- Ideal map location selected by Navy and State;
- Location is then ground-proofed (visual check onsite) by the Navy;
- Drilling rig requires minimum of 100 feet with no overhead obstructions;
- Municipal properties preferred (drainage basins or township right of ways);
- Considerations to minimize inconvenience to residents nearby:
  - Health and Safety Concerns
  - Ingress and egress
  - Noise
- Advanced notification to nearest residence

LOCAL GROUNDWATER GEOLOGY

MAGOTHY AQUIFER

Interbedded clays, sands, and gravels



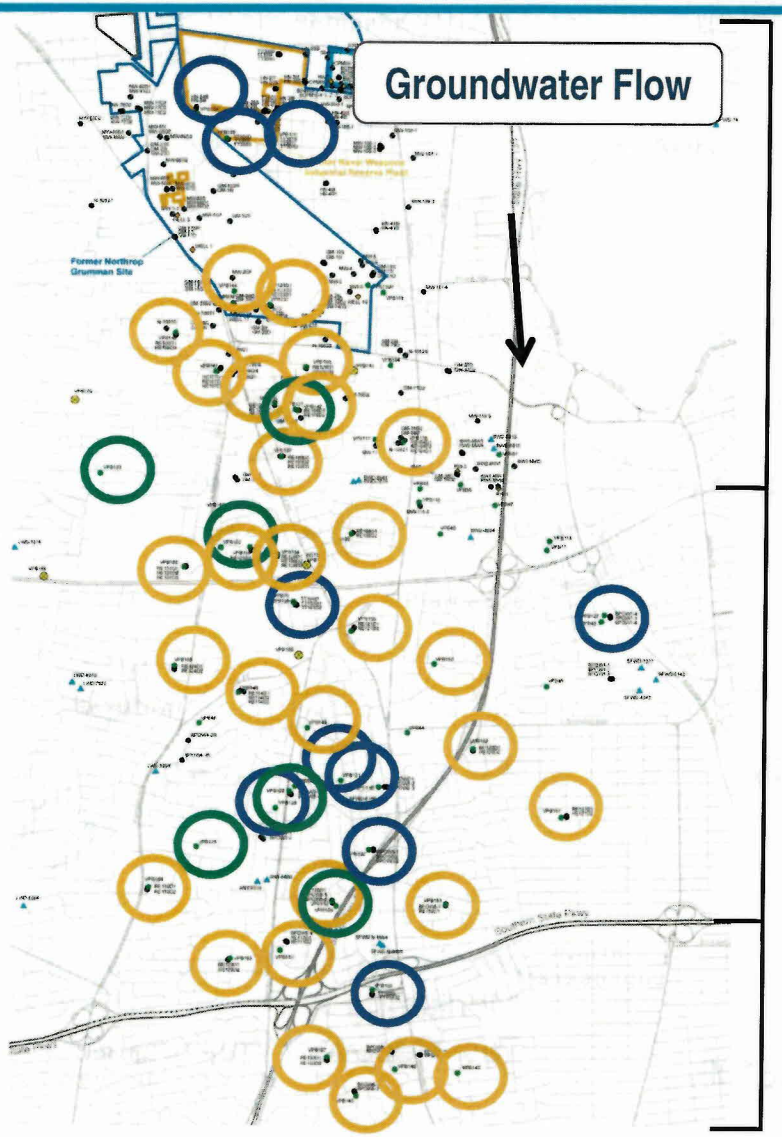
MODERN ANALOG – MACKENZIE RIVER DELTA

2009 – 2016
VERTICAL PROFILE BORINGS AND WELLS

2009 Completed (green)

2010 to 2012 Completed (blue)

2012 to 2016 Completed (orange)



North of Hempstead Turnpike Area

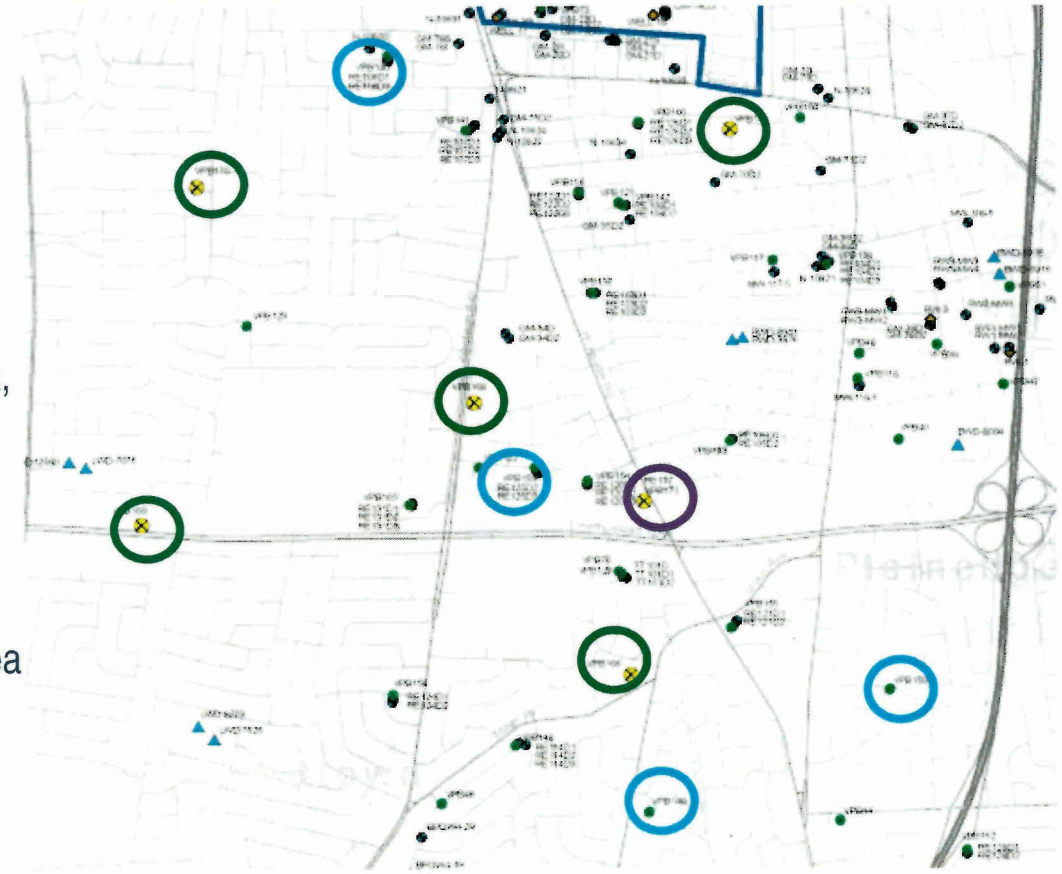
North of Southern State Parkway Area

South of Southern State Parkway Area

FUTURE WORK
VERTICAL PROFILE BORINGS AND MONITORING WELLS

Planned work through November 2017:

- Operation of 3 drilling rigs
- Installation of Vertical Profile Borings
  - 4 north of Hempstead Turnpike Area,
  - 1 north of Southern State Parkway Area
- Installation of Monitoring Wells
  - 14 north of Hempstead Turnpike Area
  - 7 north of Southern State Parkway Area
- Continue quarterly groundwater sampling
- Installation of VPB 171 and Test Recovery Well RE137 to address RE108 hotspot

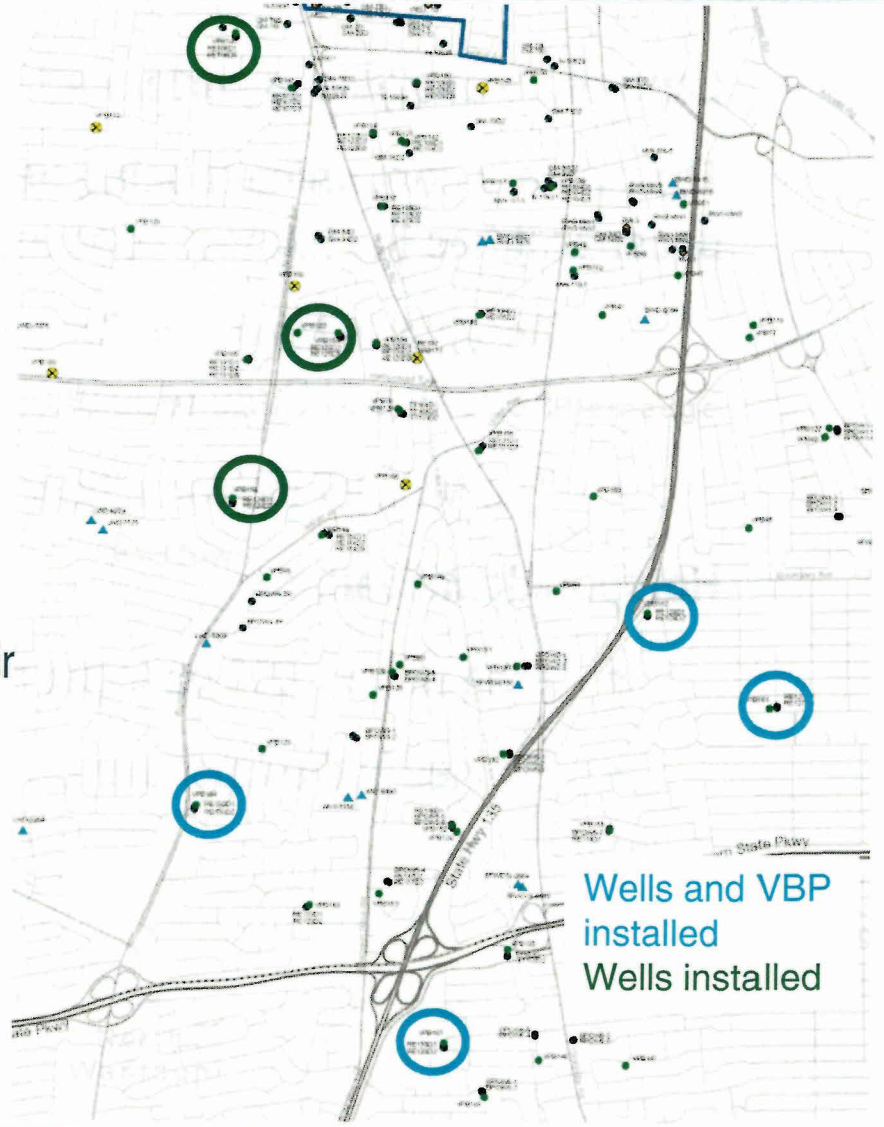


Monitoring Wells to be installed
Monitoring Wells and VPB to be installed
Test Recovery Well and VPB to be installed

RECENT WORK
VERTICAL PROFILE BORINGS AND MONITORING WELLS

From April 2016 to present

- Operation of 3 drilling rigs
- North of Hempstead Turnpike
  - Installation of 4 monitoring wells associated with VPBs 140 and 159
- North of Southern State Parkway Area
  - Installation of 2 Monitoring wells associated with VPBs 158
  - Installation of 3 VPBs 161, 162 and 164 their 6 associated monitoring wells
- South of Southern State Parkway Area
  - Installation of VPB 167 and 2 associated monitoring wells
- Completion of 2 rounds of quarterly groundwater sampling



ASSESSING GROUNDWATER RESULTS

Laboratory analysis is performed for multiple volatile organic compounds.

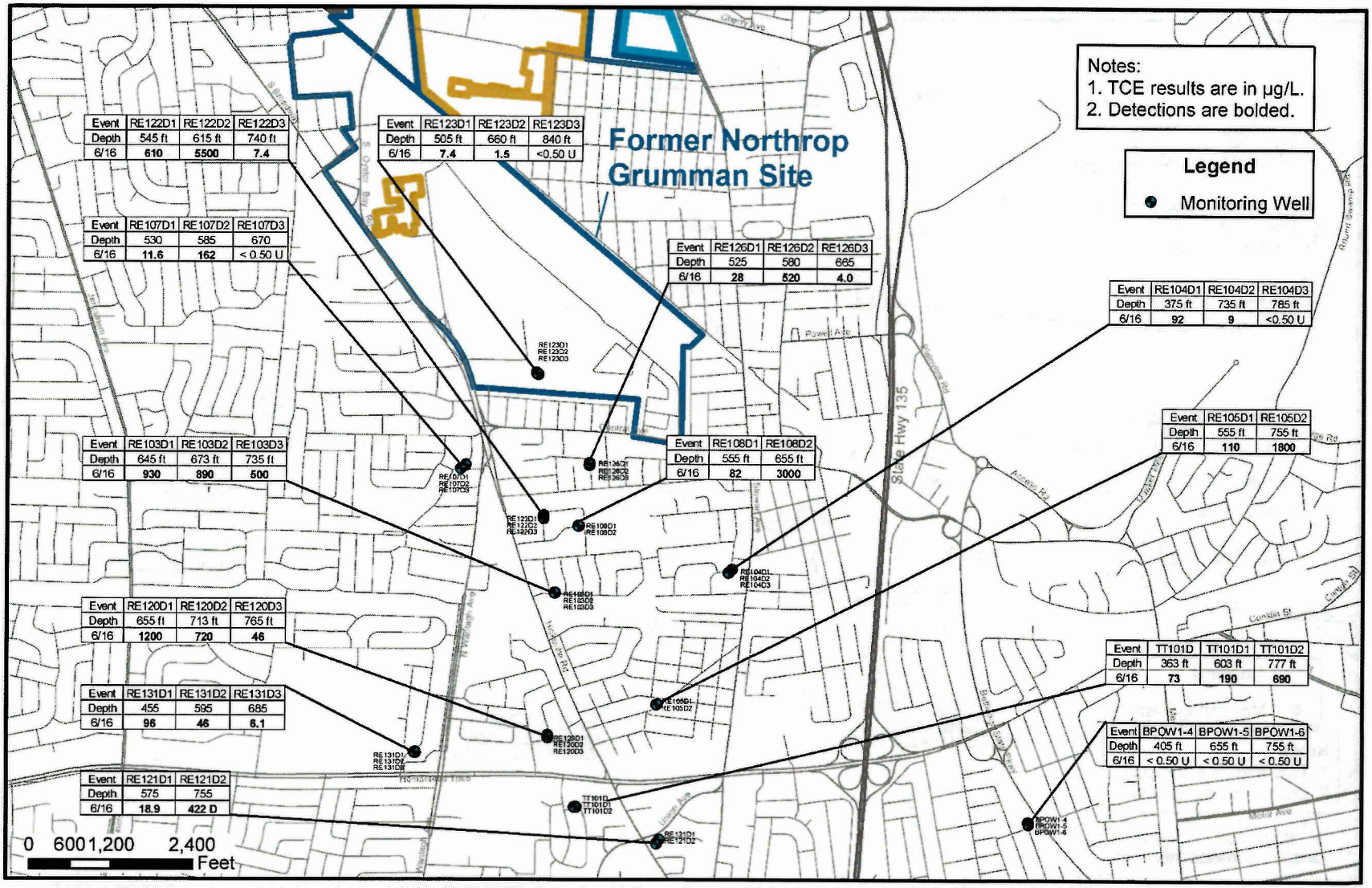
The primary contaminant being used to track the plume is trichloroethene (TCE) because it has the highest concentrations.

- Acceptable Maximum Contaminant Limit (MCL) is a limit established by Federal and State regulations
- The MCL for trichloroethene is 5 parts per billion

Hotspot Identification:

- Area with >1,000 parts per billion of total volatile organic compounds
- Defined in the Operable Unit 2 Offsite Groundwater 2003 Record of Decision

RECENT GROUNDWATER SAMPLING
TRICHLOROETHENE RESULTS NORTHERN WELLS



Event	RE122D1	RE122D2	RE122D3
Depth	545 ft	615 ft	740 ft
6/16	**610**	**5500**	**7.4**

Event	RE123D1	RE123D2	RE123D3
Depth	505 ft	660 ft	840 ft
6/16	**7.4**	**1.5**	<0.50 U

Event	RE107D1	RE107D2	RE107D3
Depth	530	585	670
6/16	**11.6**	**162**	< 0.50 U

Event	RE126D1	RE126D2	RE126D3
Depth	525	580	665
6/16	**28**	**520**	**4.0**

Event	RE104D1	RE104D2	RE104D3
Depth	375 ft	735 ft	785 ft
6/16	**92**	**9**	<0.50 U

Event	RE103D1	RE103D2	RE103D3
Depth	645 ft	673 ft	735 ft
6/16	**930**	**890**	**500**

Event	RE108D1	RE108D2
Depth	555 ft	655 ft
6/16	**82**	**3000**

Event	RE105D1	RE105D2
Depth	555 ft	755 ft
6/16	**110**	**1800**

Event	RE120D1	RE120D2	RE120D3
Depth	655 ft	713 ft	765 ft
6/16	**1200**	**720**	**46**

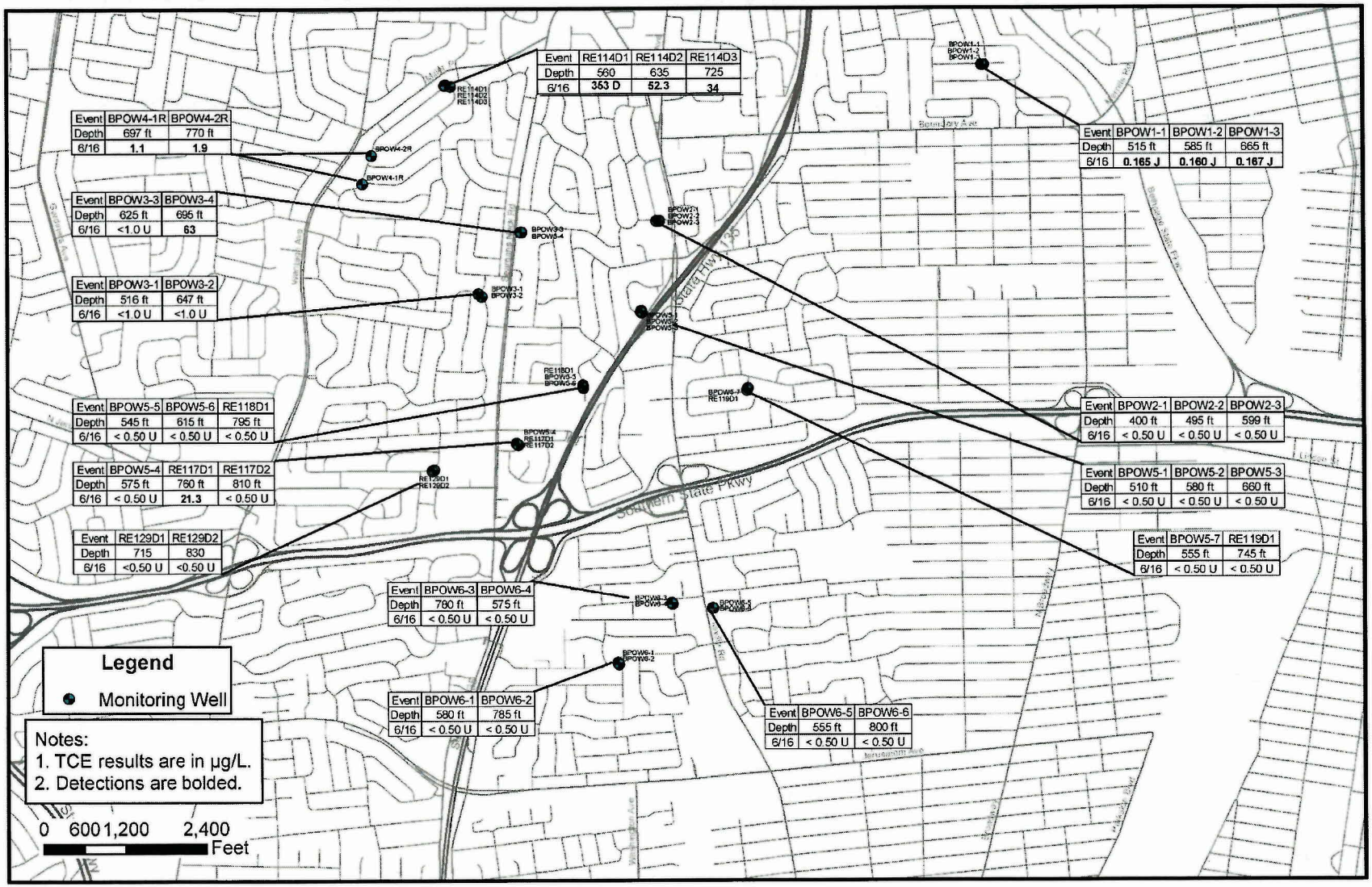
Event	TT101D	TT101D1	TT101D2
Depth	363 ft	603 ft	777 ft
6/16	**73**	**190**	**690**

Event	RE131D1	RE131D2	RE131D3
Depth	455	595	685
6/16	**96**	**46**	**6.1**

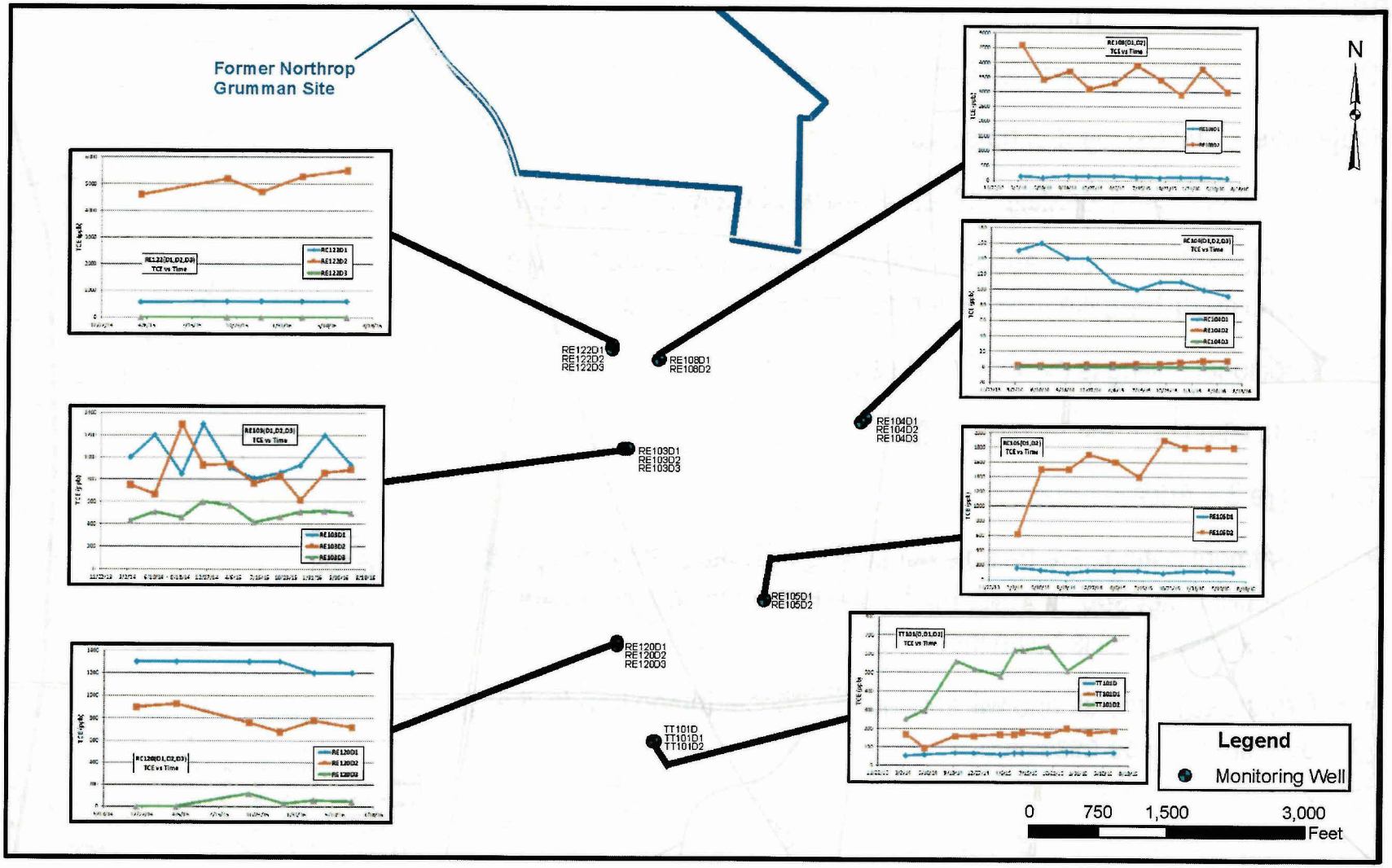
Event	BPOW1-4	BPOW1-5	BPOW1-6
Depth	405 ft	655 ft	755 ft
6/16	< 0.50 U	< 0.50 U	< 0.50 U

Event	RE121D1	RE121D2
Depth	575	755
6/16	**18.9**	**422 D**

RECENT GROUNDWATER SAMPLING
TRICHLOROETHENE RESULTS SOUTHERN WELLS



RECENT TRENDS IN RE108 HOTSPOT FROM QUARTERLY SAMPLING



GROUNDWATER SAMPLING RECENT RESULTS

- **Conclusions:**

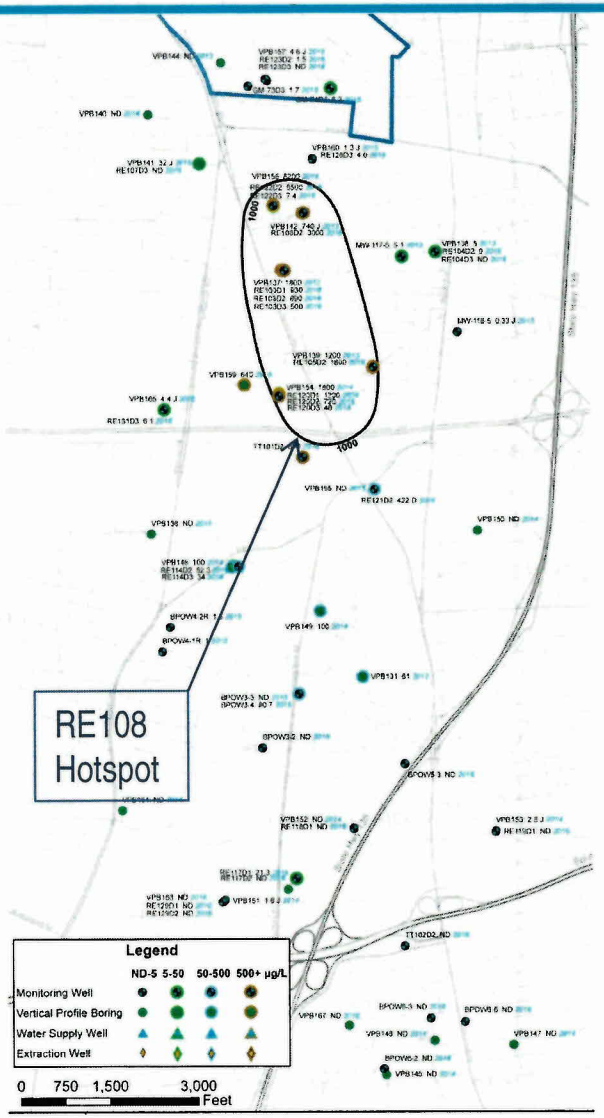
Objective 1 –Recently installed Outpost wells sampled quarterly

Objective 2 -Assessment of hotspots

- RE108 has been identified by latest phase of Navy drilling program;
- Trichloroethene found above 1,000 parts per billion in the North of Hempstead Turnpike Area at depths greater than 600 feet;
- Additional drilling is planned to the south and west;
- Installation of 1 test recovery well;

Objective 3 – Address Hotspot

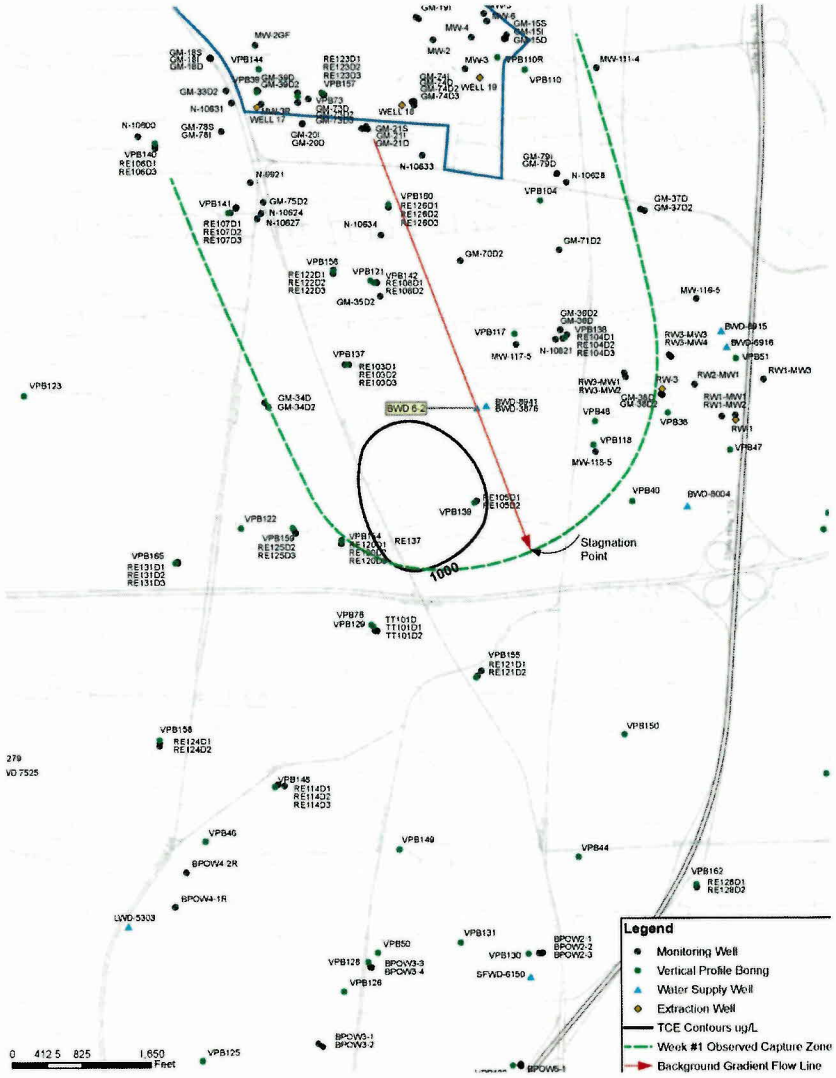
- Treatment options are being evaluated to mitigate potential impacts to public water supply wells; Pilot study has been completed and a test recovery well is being installed;
- Groundwater monitoring will continue so concentration trends, if any, over time can be assessed.



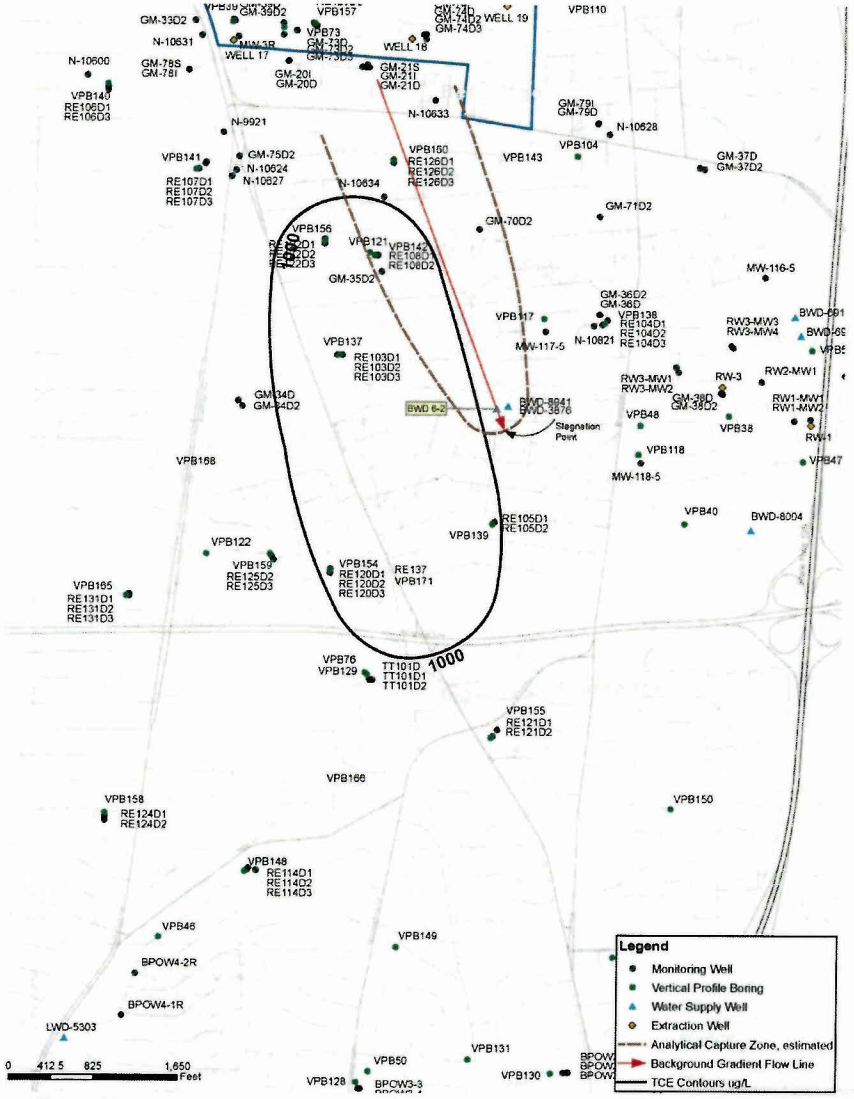
BWD WELL 6-2 CAPTURE ZONE ANALYSIS TEST

- Purpose of work is to identify capture zone of the BWD Plant 6 well in relation to the RE108 Hotspot;
- The test began March 21, 2016; and was completed on April 29, 2016;
- The depths used in the analysis to determine effects were Deep (greater than 700 feet bgs); Intermediate (600-700 feet bgs); and Shallow (500-600 feet bgs);
- Data analysis showed that at a rate of 1,153 gallons per minute the BWD Well 6-2 would capture a maximum of 100% of the deep RE108 Hotspot;
- BWD Well 6-2 would capture 14% of the intermediate and shallow RE108 Hotspot;
- The capture zone size varies depending on the pumping of existing remediation and water supply wells.

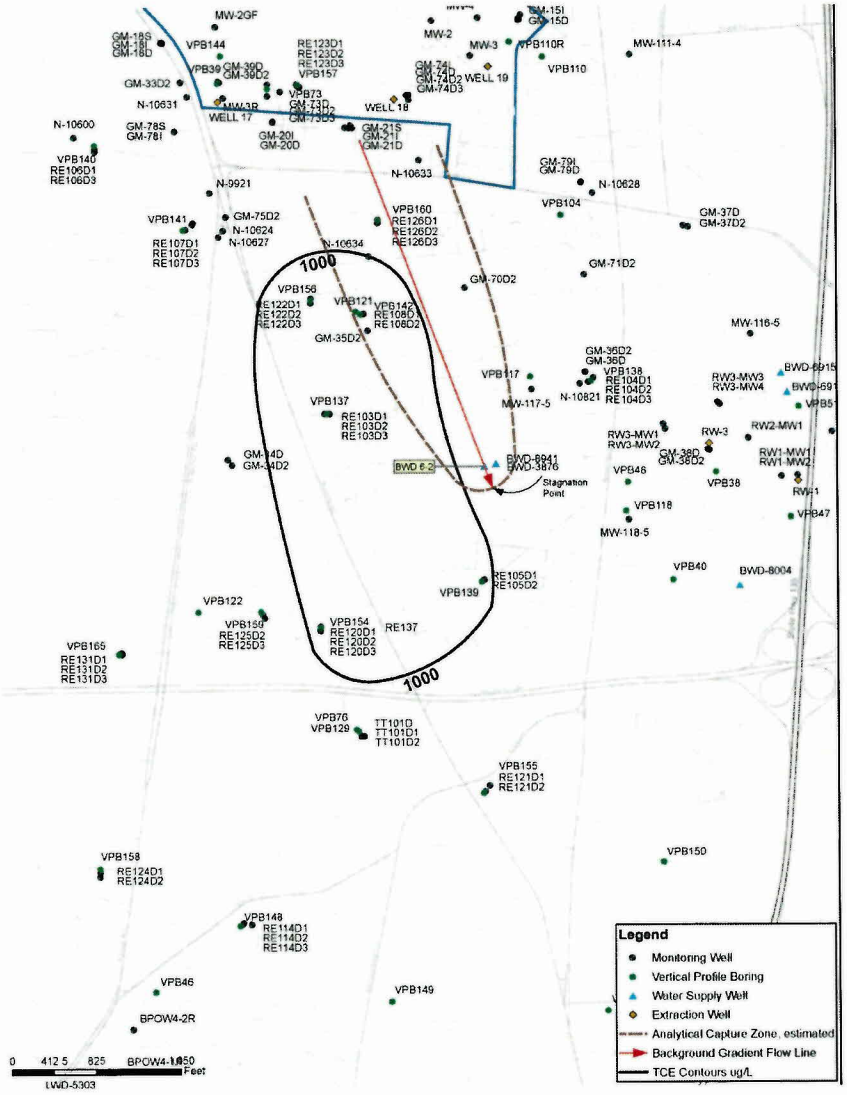
BWD WELL 6-2: TRICHLOROETHENE PLUME AND DEEP CAPTURE ZONE



BWD WELL 6-2: TRICHLOROETHENE PLUME AND INTERMEDIATE CAPTURE ZONE



BWD WELL 6-2: TRICHLOROETHENE PLUME AND SHALLOW CAPTURE ZONE



VPB AND TEST RECOVERY WELL INSTALLATION IN RE108 HOTSPOT

- VPB (VPB 171) and a test recovery (RE137) well are being drilled in Nassau County recharge basin #305, near intersection of Hicksville Road and Hempstead Turnpike;
- Drilling is expected to be completed by January 2017;
- Aquifer testing to evaluate the capture zone of the test recovery well is expected to take 5 days;
- Data analysis is expected to be completed by July 2017.

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RE108 HOTSPOT UPDATE

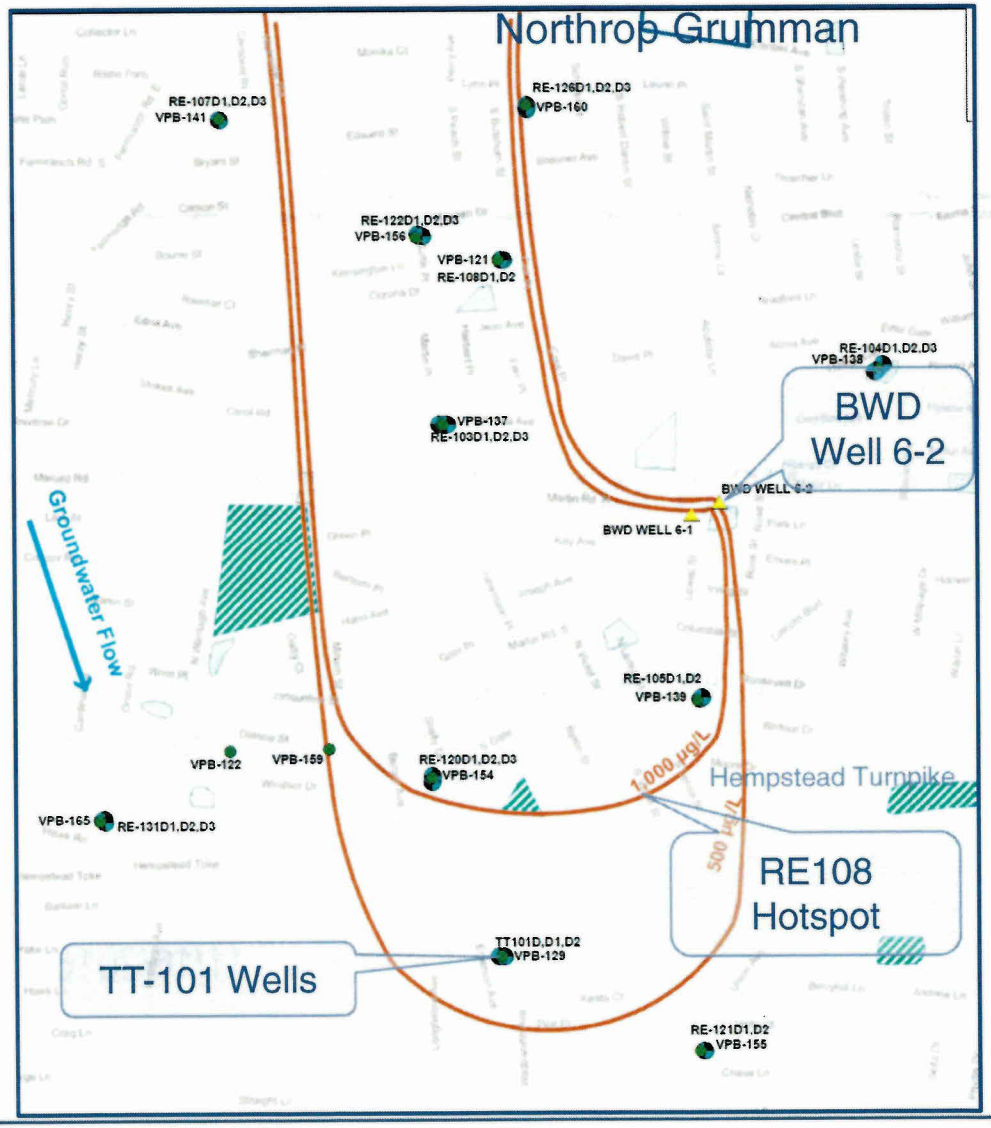
NOVEMBER 2016 RESTORATION ADVISORY BOARD

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE
LONG ISLAND, NEW YORK

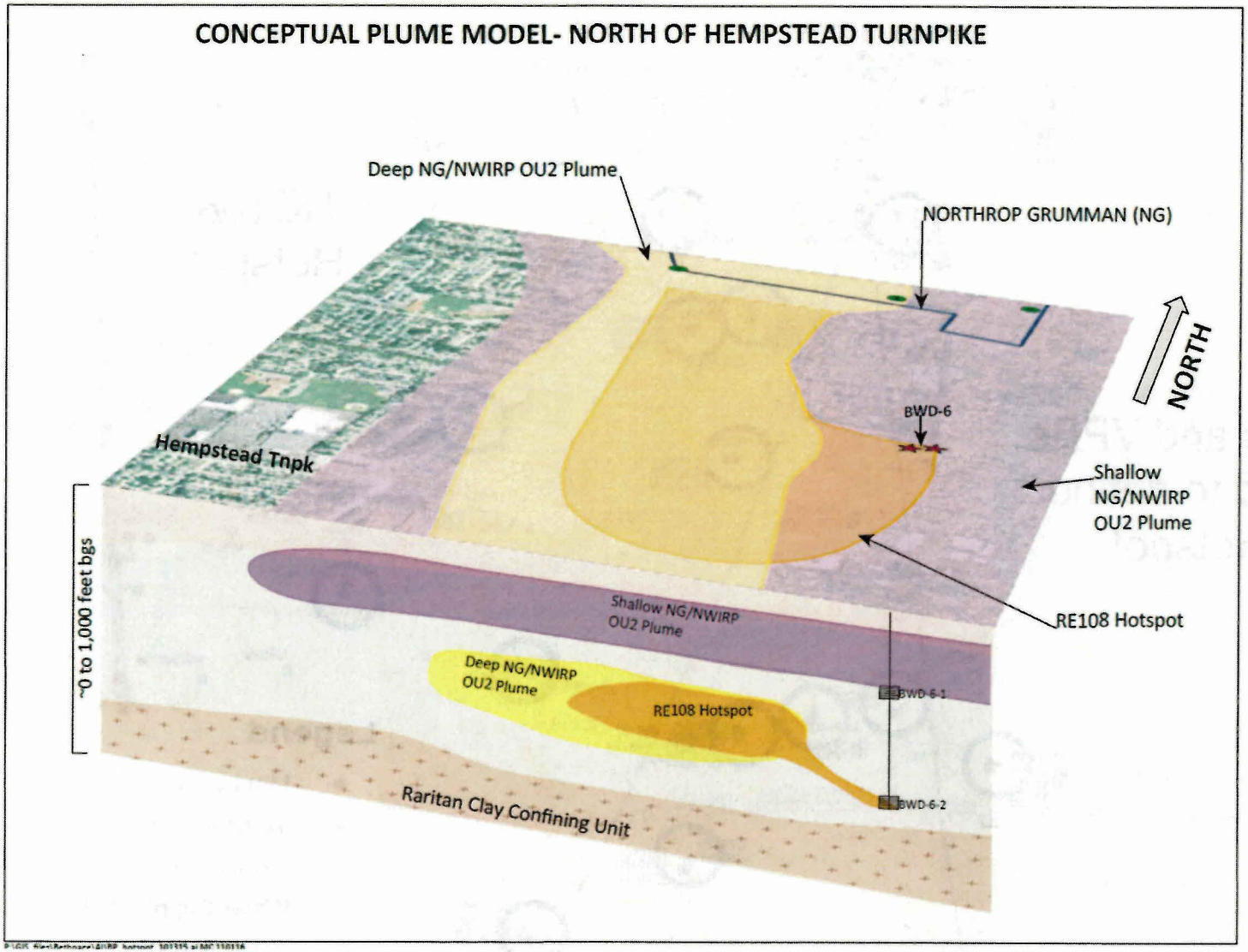
11/16/2016

RE108 Hotspot Area Investigation

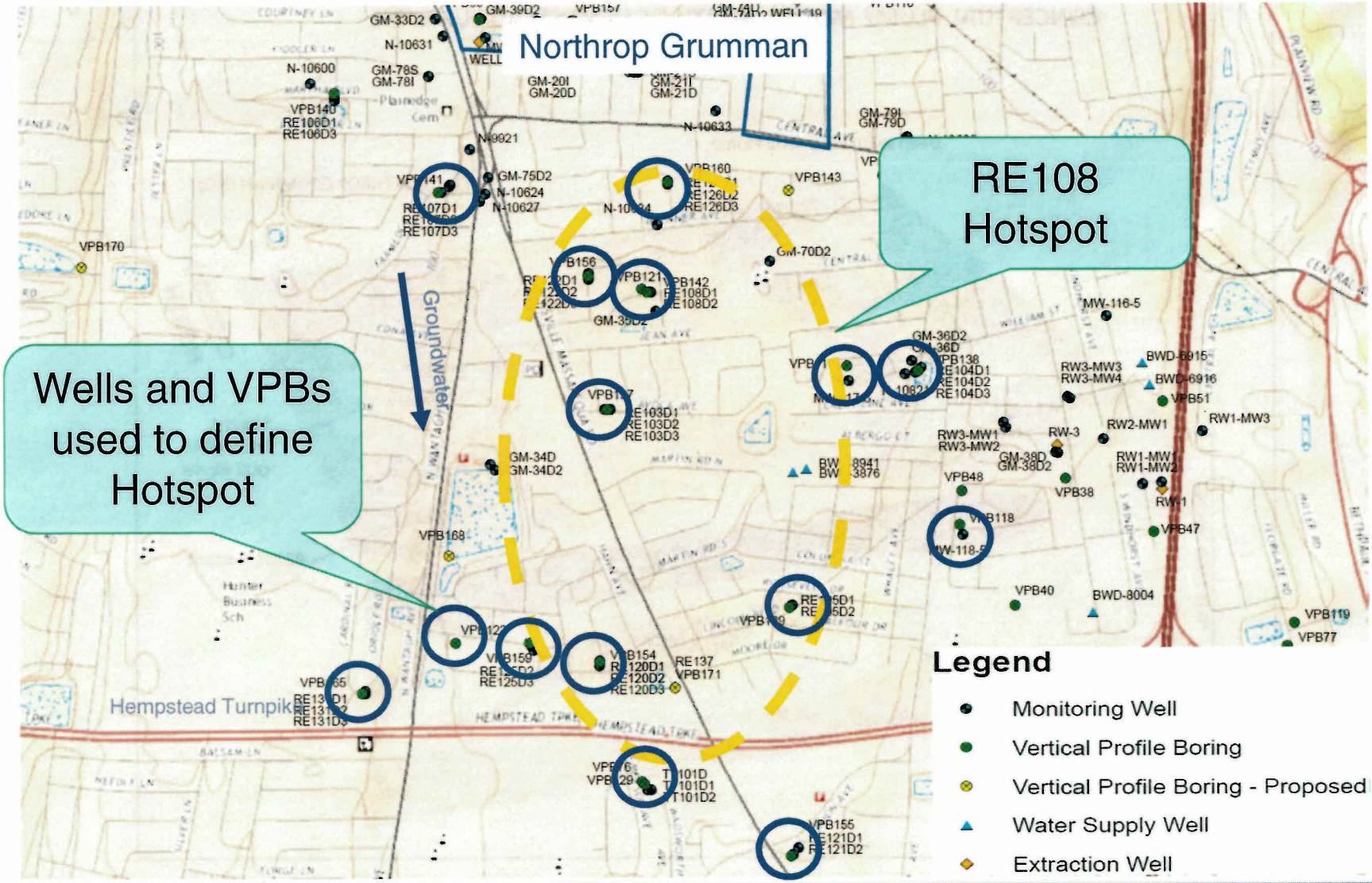
- RE108 Hotspot Area
  - Vertical profile boring and monitoring well investigations are ongoing, but is sufficient to proceed with preliminary design activities



Conceptual Site Model – RE108 Hotspot Area



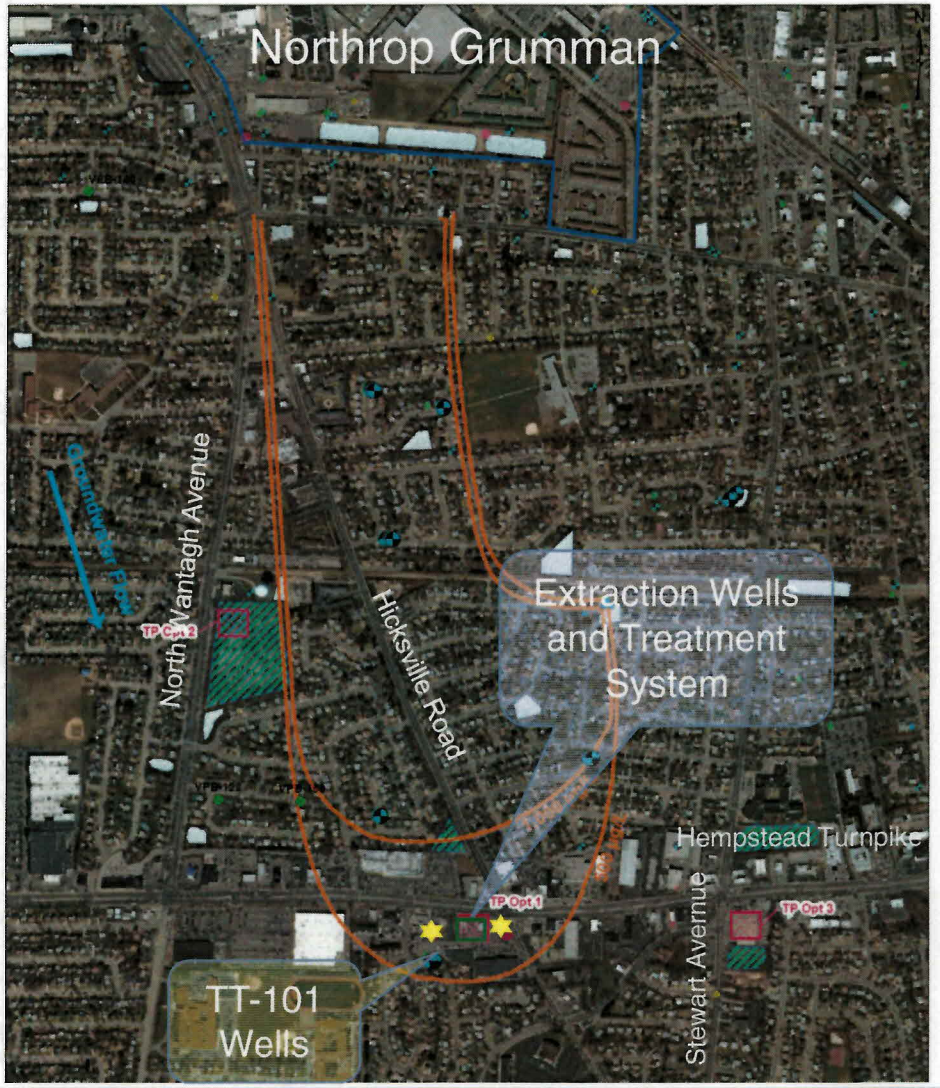
RE108 Hotspot Area – Plume Delineation Using Vertical Profile Borings



RE108 Hotspot Area

Design

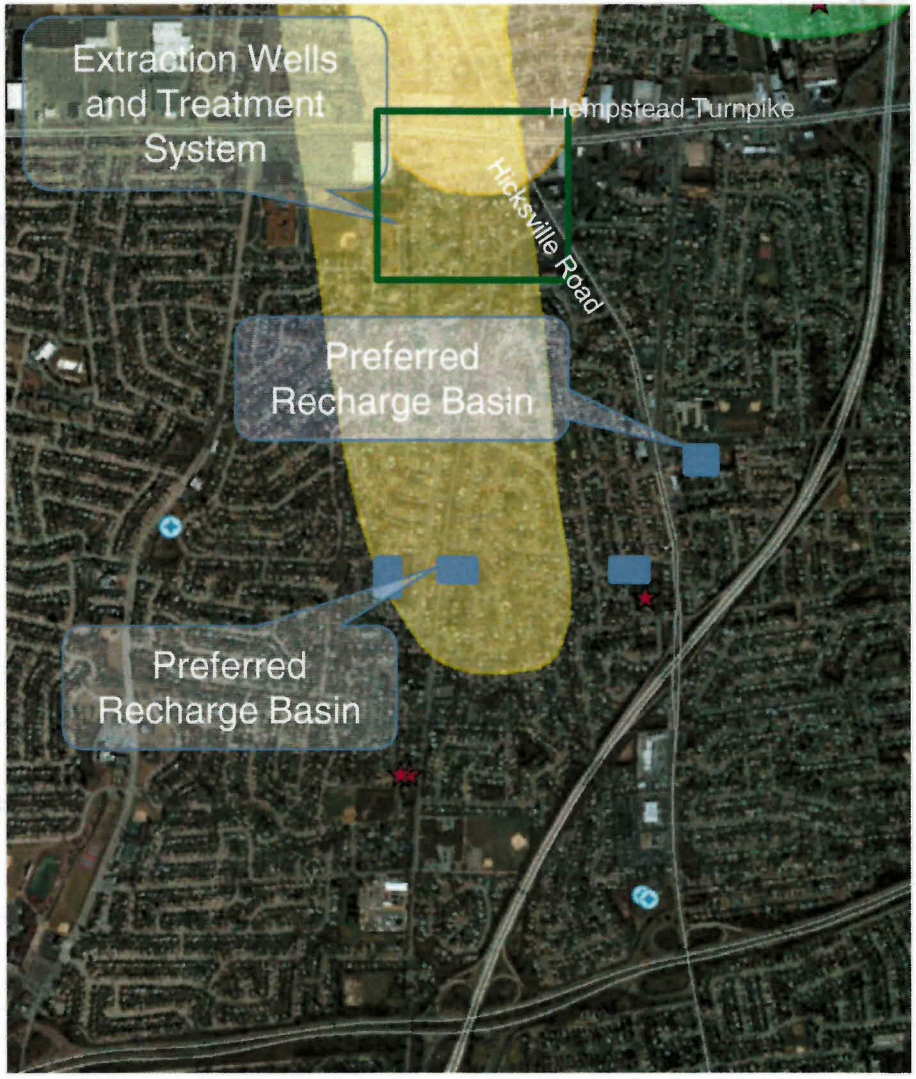
- Pumping rate of 900 to 1,200 gallons per minute
- Treatment Process: Air Stripping and Granular Activated Carbon
- Treatment Goal: Drinking Water Standards
- Treatment Plant Dimensions: 80 feet by 100 feet by 25 feet high
- Treatment Plant property buffer, minimum of 100 feet to occupied structures – 2 acres



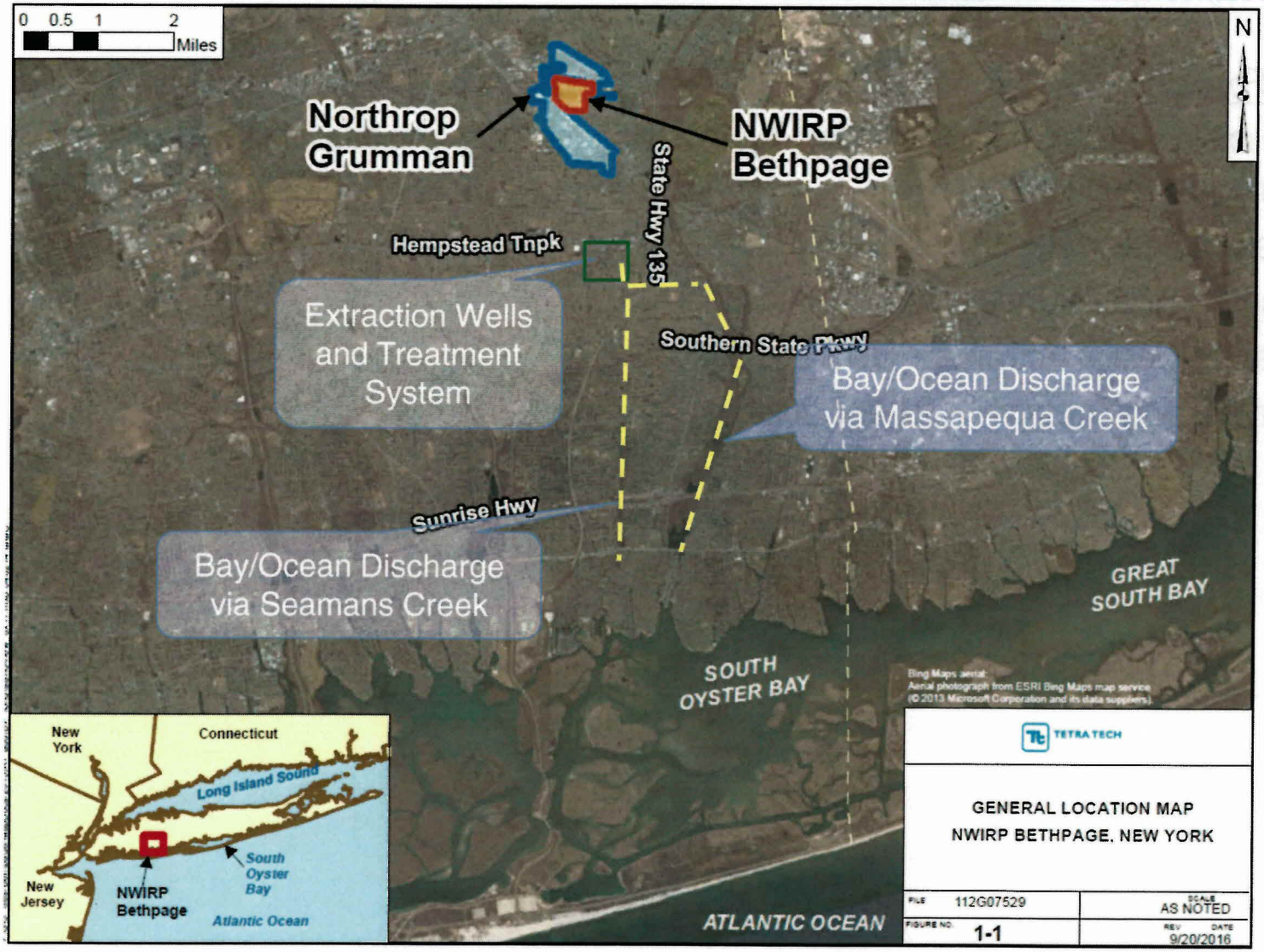
RE108 Hotspot Area

Design (Continued)

- Discharge to Recharge Basin, Hicksville Road – 3,500 feet southeast
- Other potential discharge options for treated water include:
  - –Injection Wells various locations
  - –Creeks/South Oyster Bay



RE108 Hotspot Area, Other Potential Discharge Options



RE108 Hotspot Area Path Forward

Path Forward

- Preliminary design activities underway, including pumping and basin recharge testing planned for 2017
- Basis of Design Report – 2017
- Property Access Underway – 2016 to 2019
- Detailed Design Activities – 2019 and 2020
- Construction/Startup – 2021 and 2022

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FEASIBILITY STUDY ADDENDUM
SITE 1 – FORMER DRUM MARSHALLING AREA

NOVEMBER 2016 RESTORATION ADVISORY BOARD

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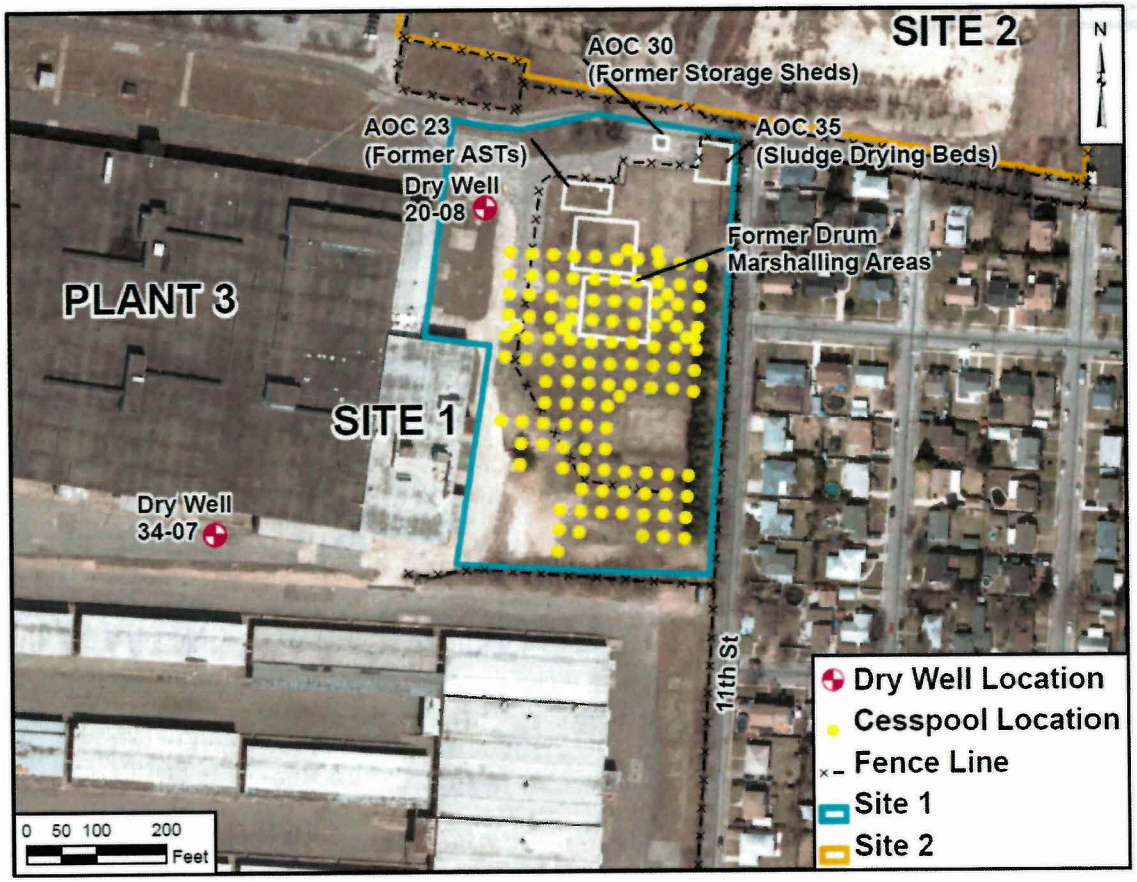
LONG ISLAND, NEW YORK

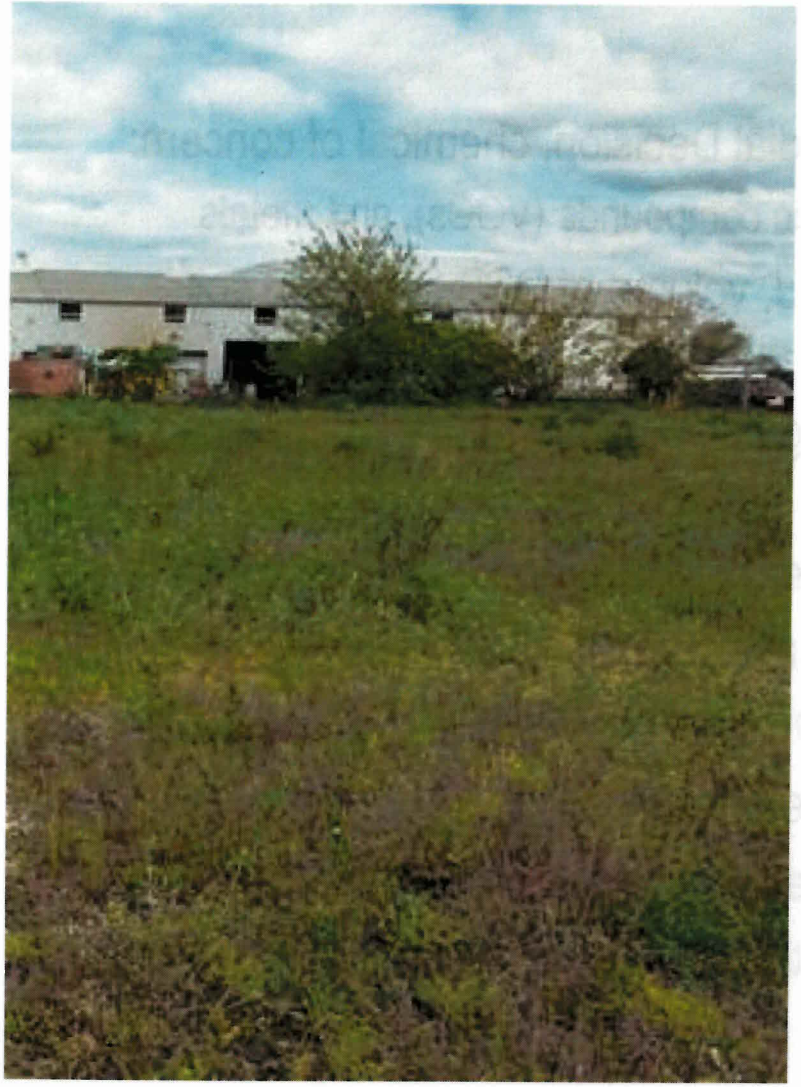
11/16/2016

Site 1 History

- Two former drum marshalling pads
- 120 abandoned cesspools for sanitary waters from Plant 3
- Drywells – Area of Concern (AOC) 34-07 and AOC 20-08 for storm water
- AOC 23-Former Aboveground Storage Tanks (ASTs),
- AOC 35-Former Sludge Drying Beds, and
- AOC 30-Storage Sheds



Site 1 - 2016 Photographs



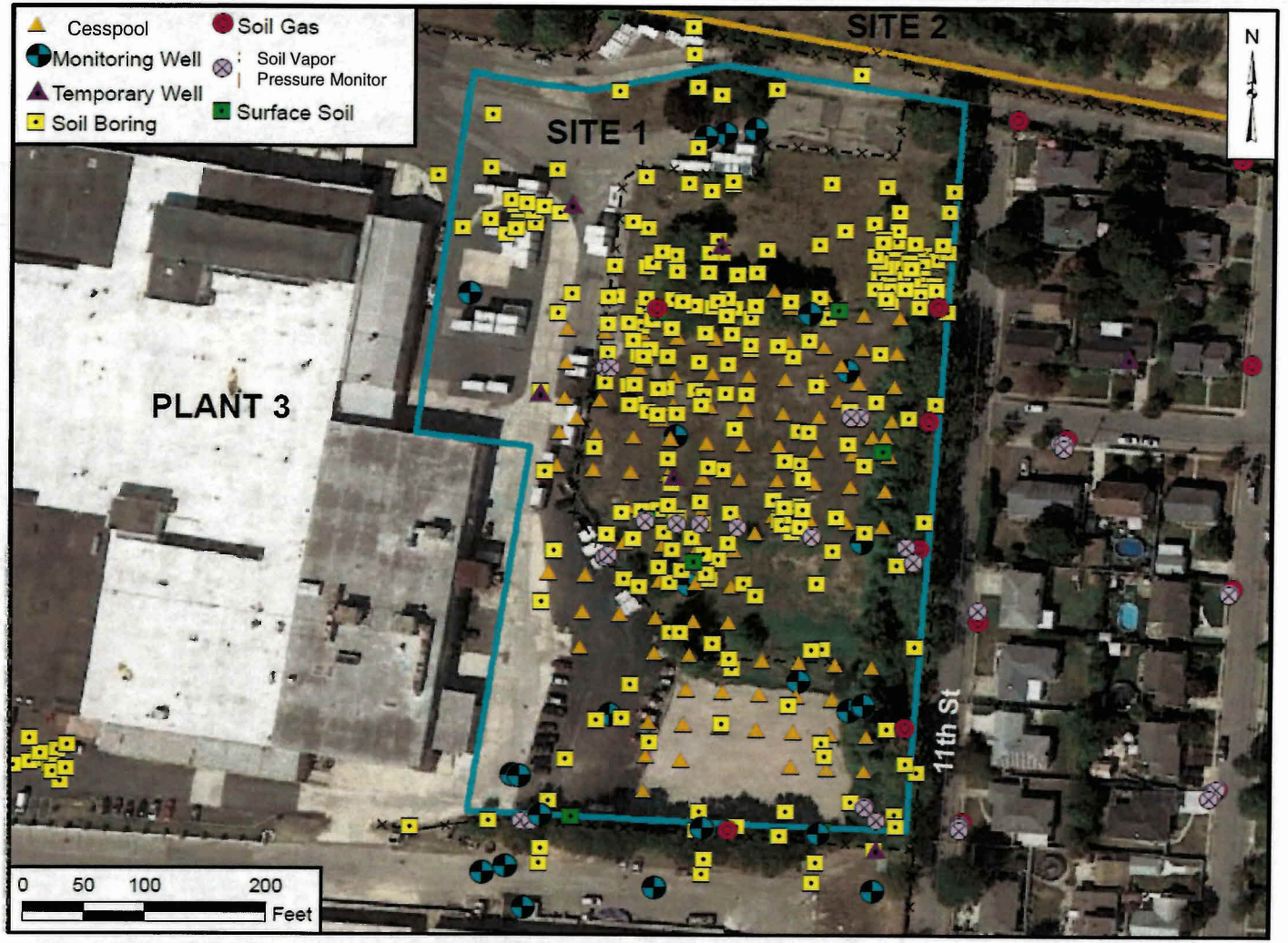
Site 1 History

Remedial Site Activities

- 1992 to1995- Initial investigations through Remedial Decision, chemical of concern:
  - –Polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), and metals
- 1995 to 2008- Additional investigations conducted, volume of PCB-impacted soil increased from 1,400 cubic yards to over 38,000 cubic yards
- 1997 to 2002- Source area cleanup of volatile organic compound (VOC)-impacted soil and shallow groundwater
  - –Air Sparging/Soil Vapor Extraction (SVE) Remediation System
  - –4,520 pounds of VOCs had been extracted and treated
  - –Achieved greater than 95% reduction of VOCs in groundwater
- 2009 to 2013- Supplemental soil and groundwater investigations
- 2010 to 2016- SVE Containment System operates to address vapor intrusion
- 2015 Remedial Investigation Addendum completed

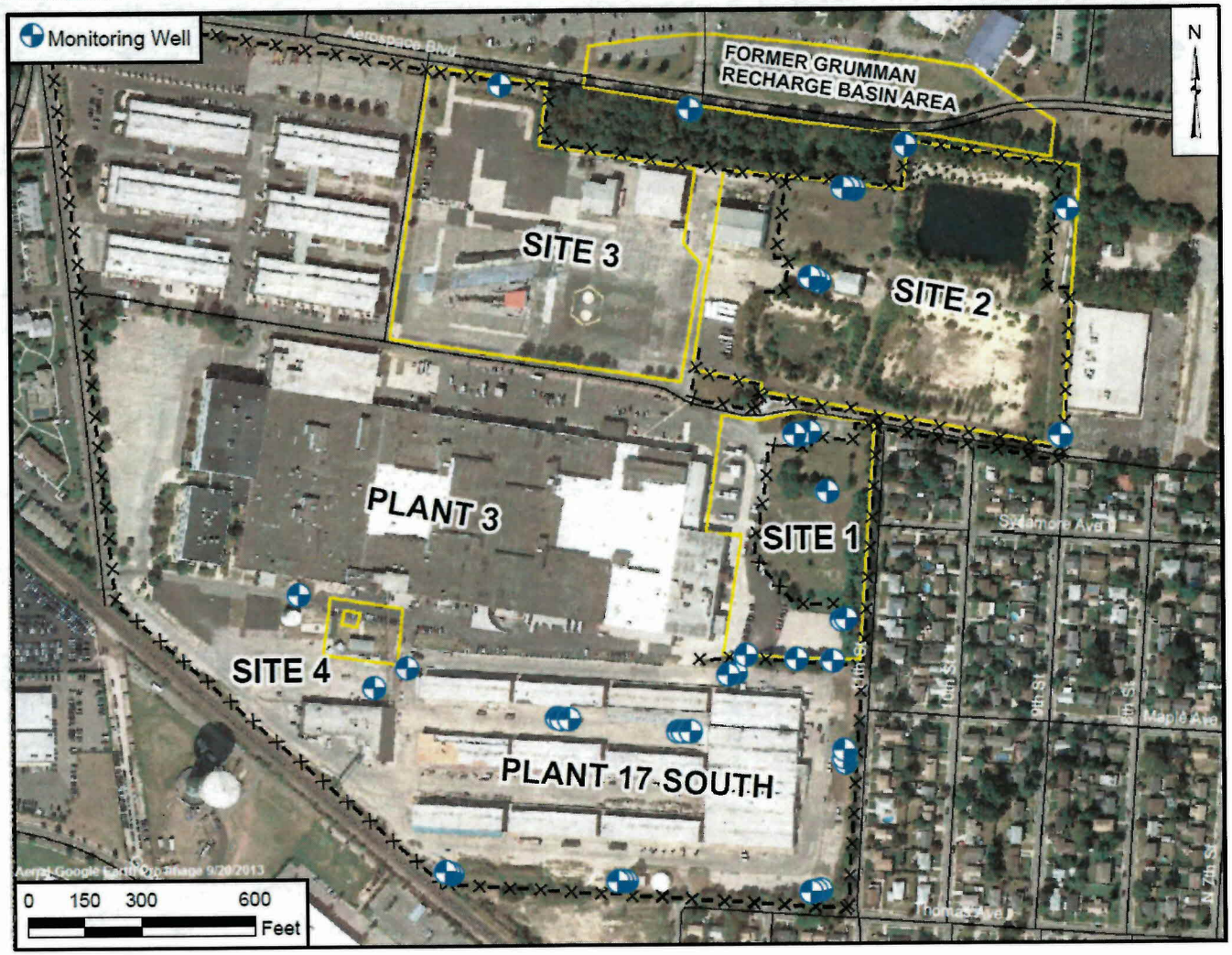
Site 1 Remedial Investigation Addendum

Field Activities (1991 to present)



Site 1 Remedial Investigation Addendum

Groundwater Field Activities (2009 to 2013)

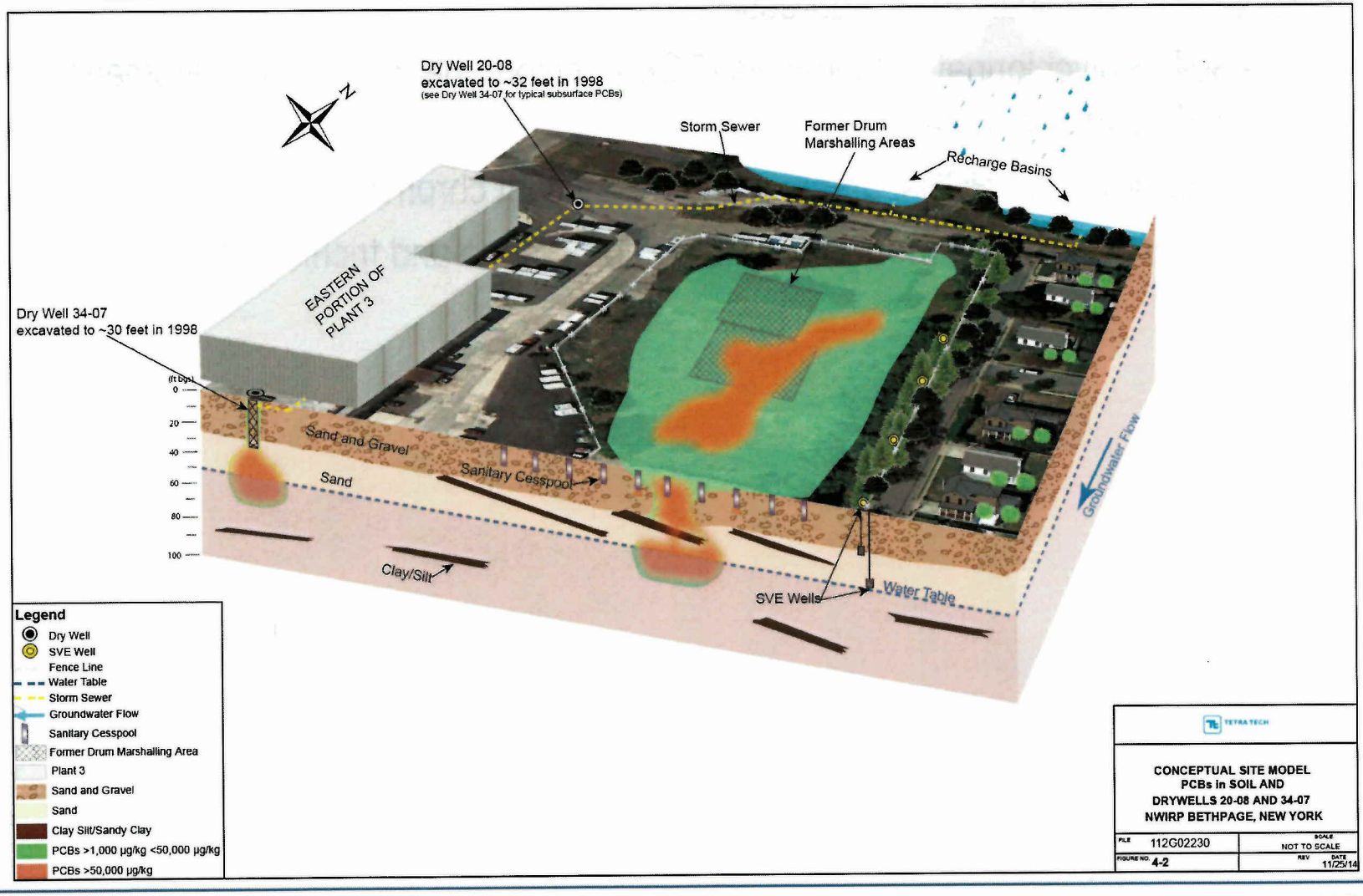


Site 1 Remedial Investigation Addendum

- Media and chemicals to be addressed:
  - –Soil: Polychlorinated biphenyls (PCBs), chlordane, polynuclear aromatic hydrocarbons, metals
  - –Groundwater: PCBs, arsenic, and hexavalent chromium
  - –Soil Vapor (Vapor Intrusion): Tetrachloroethene and trichloroethene

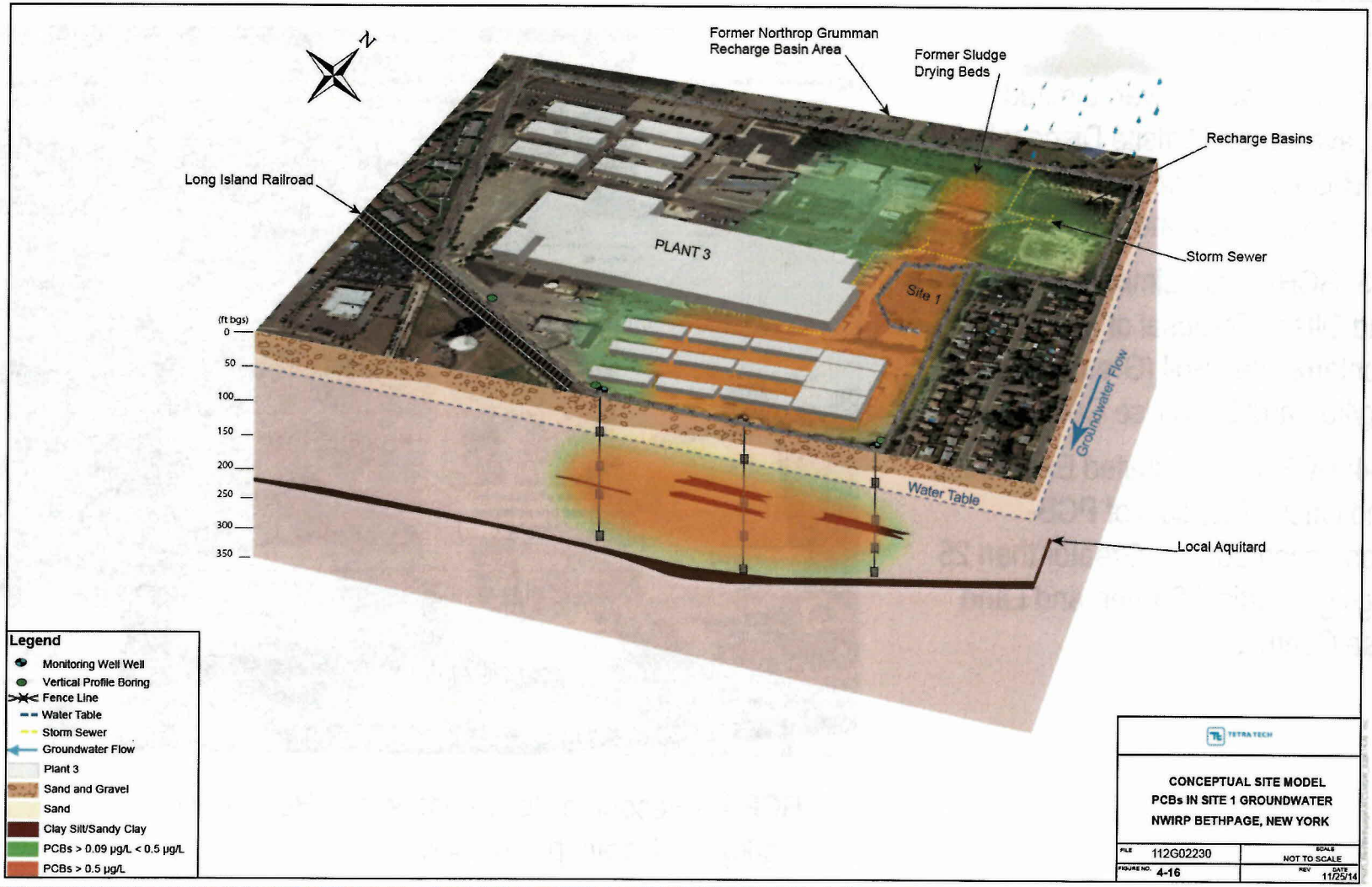
Site 1 Remedial Investigation Addendum

Results - PCBs in Soil



Site 1 Remedial Investigation Addendum

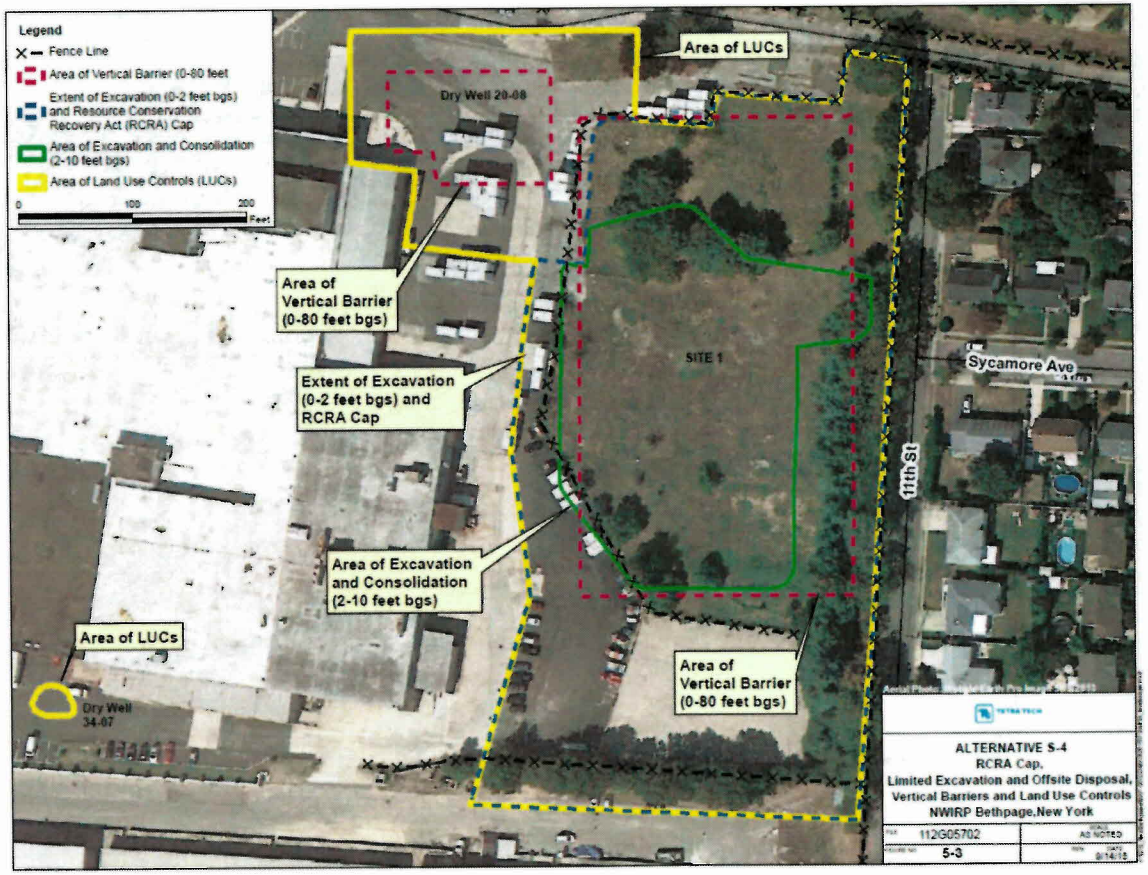
Results – PCBs in Groundwater



Site 1 Feasibility Study Addendum

Soil Alternatives

- S-1: No Action
- S-2: Permeable Cover, Limited Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than 10 mg/kg), and Land Use Controls
- S-3: RCRA Cap, Limited Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than 25 mg/kg), and Land Use Controls
- S-4: RCRA Cap, Limited Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than 25 mg/kg), Vertical Barrier, and Land Use Controls

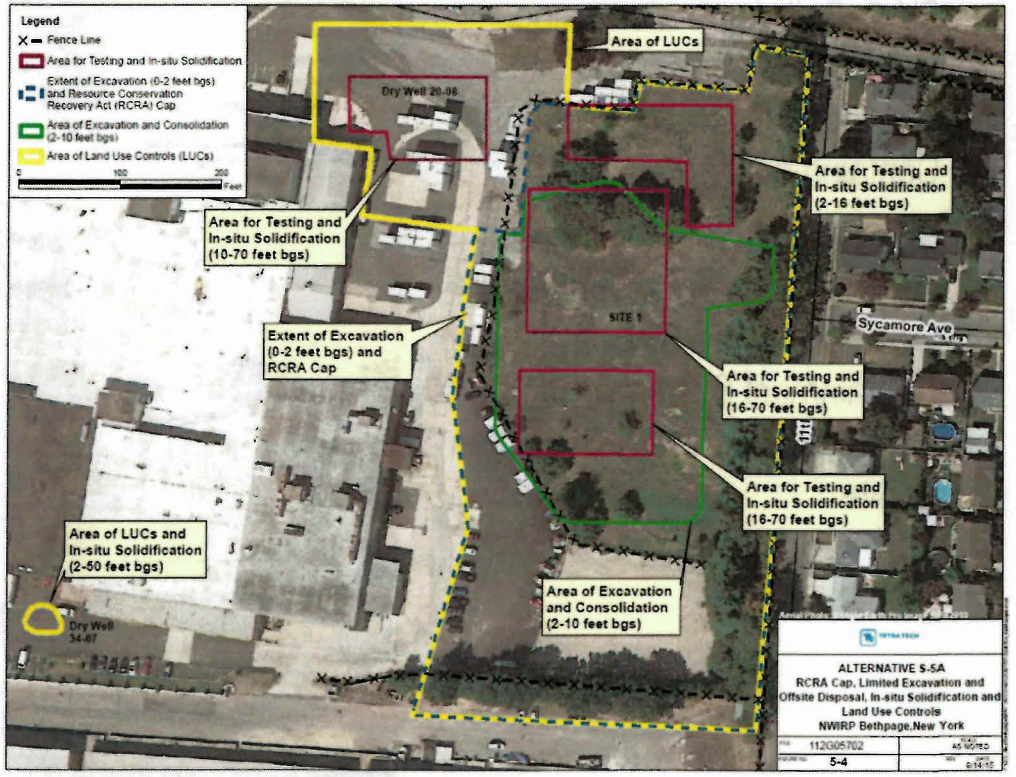


RCRA – Resource Conservation and Recovery Act
mg/kg – milligram per kilogram

Site 1 Feasibility Study Addendum

Soil Alternatives

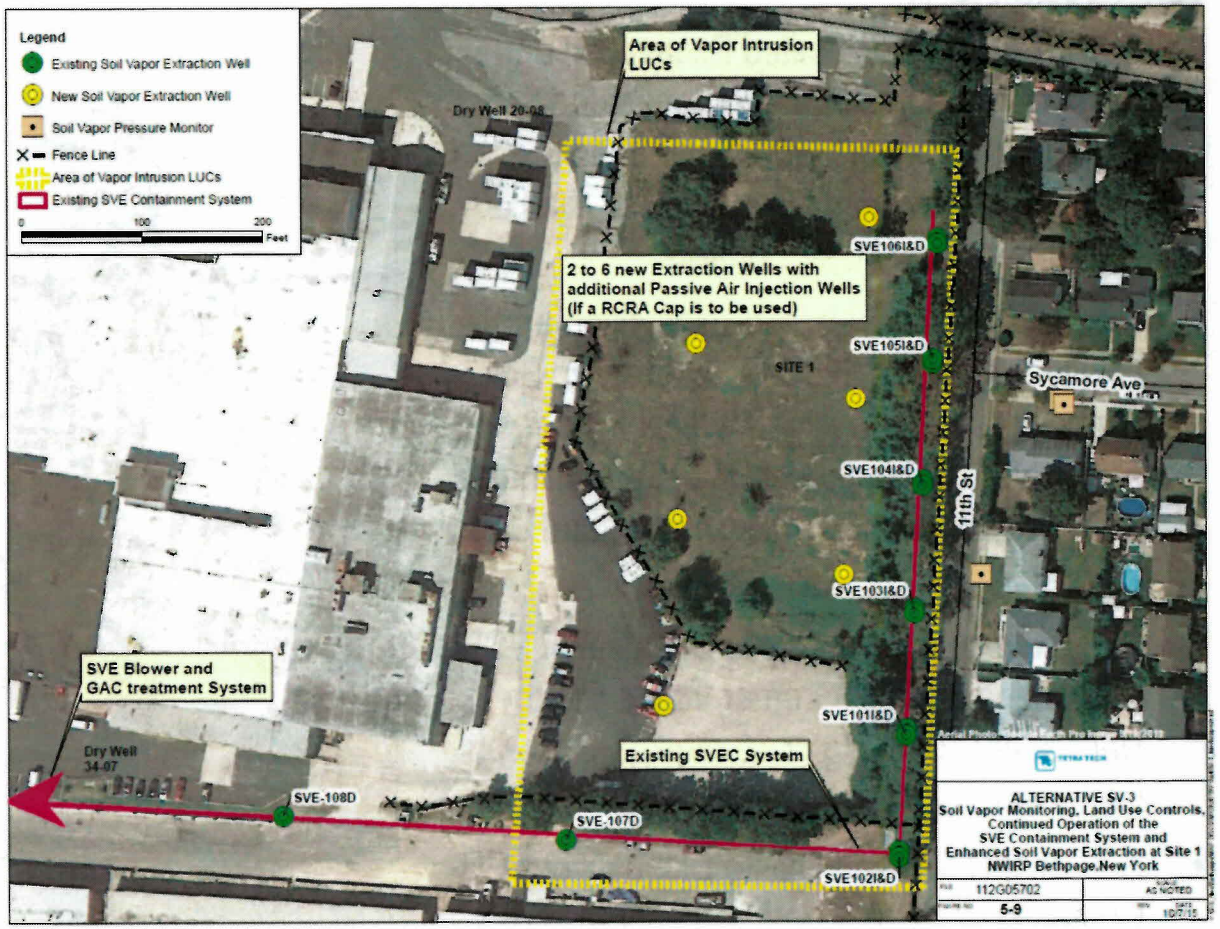
- S-5A: RCRA Cap, Limited Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than 25 mg/kg), In-situ Solidification of PCB-Contaminated Soil (Greater than 50 mg/kg), and Land Use Controls
- S-5B: RCRA Cap, Limited Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than 25 mg/kg), Vertical Barrier, In-situ Solvent Extraction of PCB-Contaminated Soil (Greater than 50 mg/kg), and Land Use Controls
- S-6: Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than a Depth-Dependent 10 mg/kg or 50 mg/kg), Soil Cover, and Land Use Controls
- S-7: Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than 1 mg/kg)



Site 1 Feasibility Study Addendum

Soil Vapor Alternatives

- SV-1: No Action
- SV-2: Soil Vapor Monitoring, Land Use Controls, and Continued Operation of the SVE Containment System
- SV-3: Soil Vapor Monitoring, Land Use Controls, Continued Operation of the SVE Containment System, and Enhanced Soil Vapor Extraction at Site 1



Site 1 Feasibility Study Addendum

Groundwater Alternatives

- G-1: No Action
- G-2: Monitoring and Land Use Controls
- G-3A: Monitoring, Land Use Controls, and Upgrade of the ONCT System with GAC Treatment
- G-3B: Monitoring, Land Use Controls, and Upgrade of the ONCT System with Ion Exchange Treatment

Path Forward

- 2017 Proposed Plan (45-day public comment period)
- Public Meeting in Jan/Feb 2017 (to be announced)
- 2017 Record of Decision
- 2017 Design
- 2018 Start Cleanup